SRRR
Sustainable & Resilient Resources Roundtable

https://sustainableroundtable.org

Link to Video of the Workshop

https://www.youtube.com/watch?v=vtr-SynWa7M&t=4s

Proceedings

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Introduction to Sustainable & Resilient Resources Roundtable

David Berry, SRRR Director

David gave a brief summary of the history and evolution of SRRR from its beginning in the White House Council on Environmental Quality, to many years as a subgroup of the Federal Advisory Committee on Water Information and, when the previous administration dissolved ACWI, how the Roundtable became the non-profit corporation and a 501(C)(3) charitable organization that it is today.

David reminded the participants that everyone in the workshop is part of the Roundtable and welcome to contribute to the meeting via the chat room and the discussion periods.

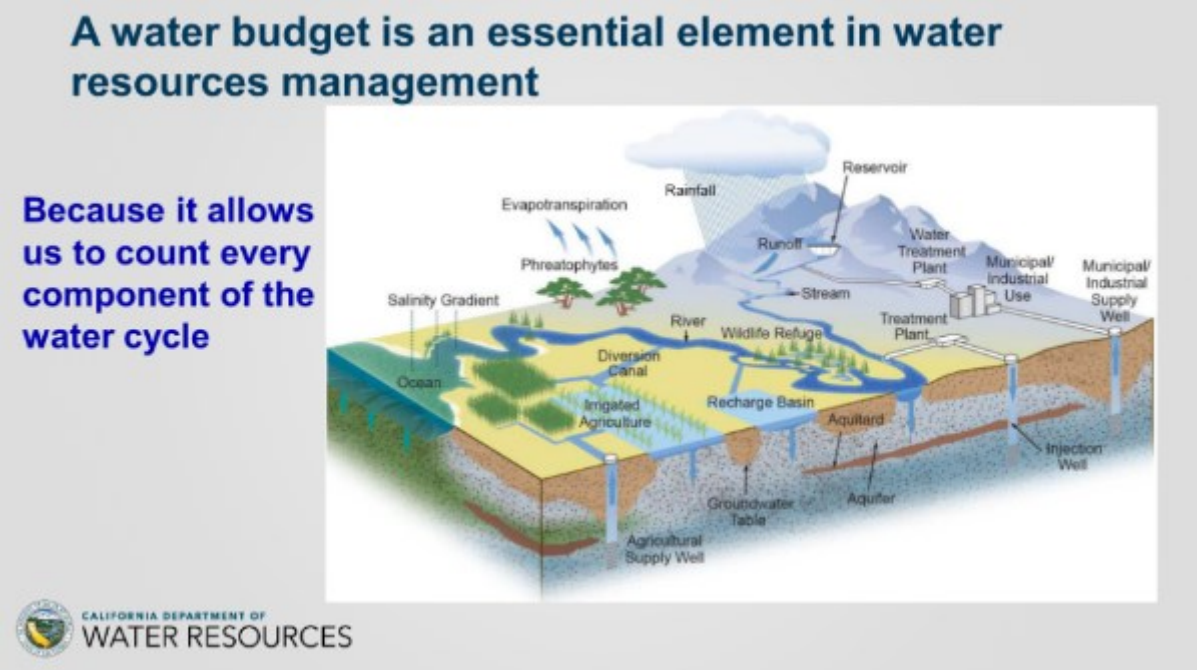
The people presenting today are all members of SRRR's own steering committee. Their organizations represent different viewpoints on resources, the State of California, the multistate and Mexico region of the basin of the Colorado River, and the national and global perspective of the Alliance for a Climate Resilient Earth.

Learn more at: https://sustainableroundtable.org

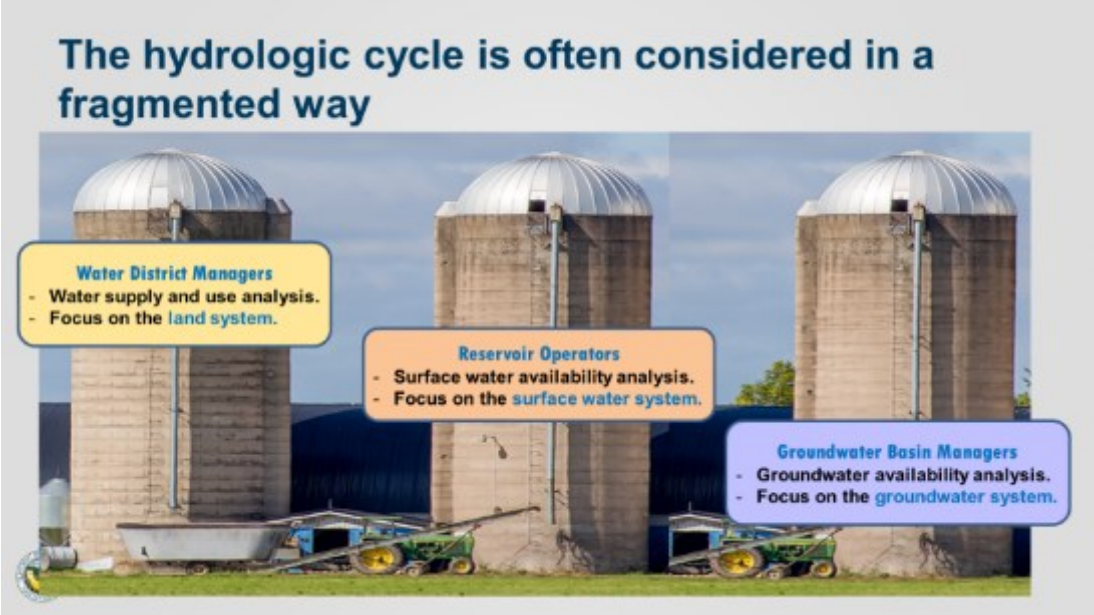
Water Budget Handbook: A Technical Reference to Help Meet Resource Management Challenges

Abdul Khan, Chief of Water Budget and Analytics Section in the Division of Planning of the California Department of Water Resources. Paul Shipman, Senior Water Resources Engineer, California Department of Water Resources.

Abdul Khan introduced the talk by explaining why the water budget was developed. Water is a limited resource that must be managed carefully. In fact, pretty much every water planning document in California talks about how important water is to it, including the recent water resilience portfolio, which emphasizes the need for a resilient and sustainable future. But the problem is we can't manage what we don't count.

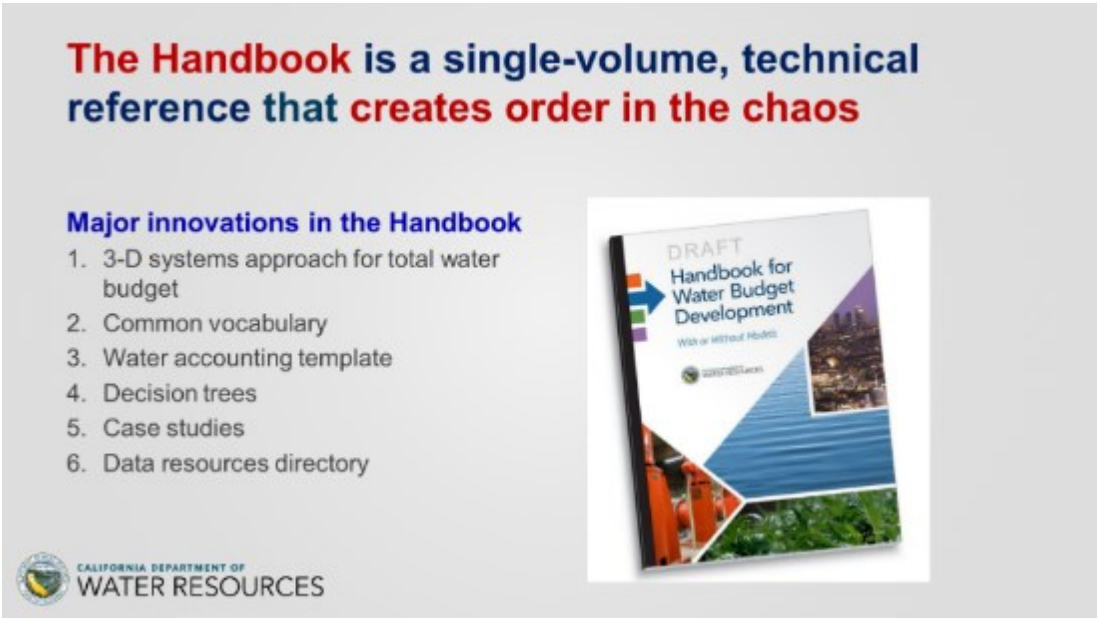


Paul Shipman began by asserting that a water budget is critical for understanding the flows of water in your area. It is kind of the baseline step to any other management actions, especially in the chaotic future where things are changing in ways we have not seen before. It is only by understanding what you currently have, that you can adapt to changing conditions.

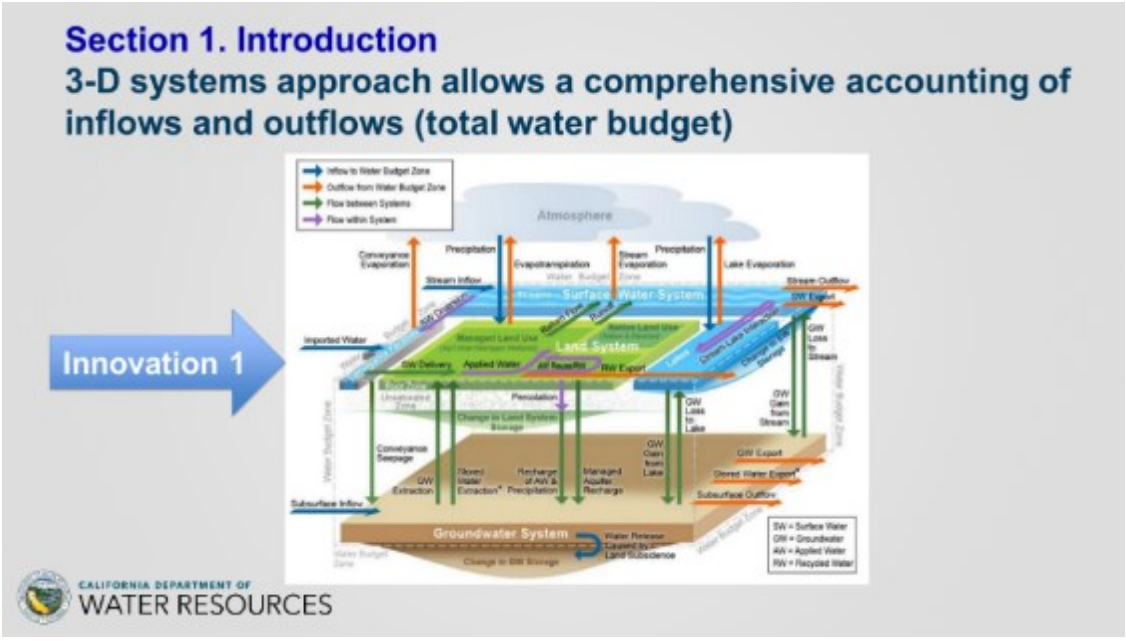


The hydrologic system is usually treated in a fragmented way, with Water District Managers focusing on the Land System, Reservoir Operators focusing on the Surface Water System, and Groundwater Basin Managers focusing on the Groundwater System. This limits communication and ends up with us operating in our own silos. Definitions can be inconsistent and terms are used for different purposes by each group. In addition, quality, data sources, and poor documentation limit the effectiveness of water budgets for future use.

The water budget handbook is a first of its kind, single-volume, practical reference for developing water budgets.



Paul acknowledged that the 400-page handbook can seem overwhelming, but assured the group that if you understand how the sections have been broken out, it can be navigated more easily and efficiently.



The first section includes a key innovation in the handbook, the first-ever three-dimensional representation of water budget components using a systems approach, providing a comprehensive accounting of inflows to and outflows from the three interacting systems: the land, surface water, and groundwater. Each of the nine sections include innovative and effective tools.

The Handbook can be used to develop water budgets to support various purposes, including:

1. Understanding how historical and future changes to supply, demand, hydrology, population, land use, and climatic conditions will affect an area
2. Water supply planning
3. Preparing feasibility studies
4. Facilitating integrated water resources management
5. Estimating and quantifying water resources
6. Identifying data gaps
7. Forecasting and assessing optimum water management actions

Paul concluded by noting that more work needs to be done. An aggressive communication plans is being pursued in order to refine the water budget and hopefully build a broad consensus. Implementation of a water accounting system will require broad agency and stakeholder buy-in and training. That's the People part to support the development of a water accounting System.

Comments and Questions from the Chat

Marianna Grossman: How is sea level rise impact on ground water levels considered?

Scott Boyce: For MODFLOW-OWHM typically we develop the ocean boundary as a sea-water equivalent head and then use particle tracking to see how far the infiltration can occur. There is the Seawater Intrusion (SWI) package, which can do advection based seawater intrusion, but it significantly slows the simulation down. If the models need to account for density dependent flow, then the groundwater flow vectors can be linked to MT3D or MT3D-USGS to do advance-dispersion simulation of the seawater.

John Wells: Nature fluctuates and is designed by this. People need certainty and predictability. While I'm not sure what statistics the handbook uses or recommends (e.g., average or median flows, 7-day—10-year low flows, etc.), how does the handbook address the needs of water fluctuations needed by nature, whether it's to scour streams and floodplains or maintain variable, as well as low flows?

Marianna Grossman: What impact on hydrological system could systems that remove moisture from air to create potable water?

Paul Shipman: In the water budget handbook framework, we would include systems that remove moisture from the air to create potable water as a subcategory under "imported water" as it would be making water available to the system that was previously unavailable (in the atmospheric system)

Marty Kress: What are the key space based and ground based assets you rely upon for surface and subsurface water data

Abdul Khan: Section 9 of the handbook is a data resources directory which provides a catalogue of data sources for calculating the various water budget components. The handbook does not suggest what data sources water practitioners would choose to use. That we leave to the practitioners based on their needs and assessments. Over time, the goal is to expand the data resources directory as new data sources become available or we come to know about them.

An Update on ACRE and Its Partnership Models Stan Bronson, ACRE

Update on the Alliance for a Climate Resilient Earth (ACRE)

ACRE was formed on January 29, 2020 as thirty organizations came together at the Stimson Center, one of Washington DC's most prestigious think tanks. In February 2021 The University of Pennsylvania, which ranks global think tanks, ranked Stimson as number 10 out of 2000 in the US, and ranked Stimson number two in the world when innovation is the consideration. Beginning with the original thirty, ACRE has grown exponentially over the past year to over 125 member organizations that include some of the largest organizations on the globe from the private, academic, NGO and government sectors. ACRE is also quite proud of being the only organization that has seven USDOE National Laboratories as Founding Members.

The formative meeting of the Alliance for a Climate Resilient Earth (ACRE) at the Stimson Center, January 29, 2021

ACRE is an alliance of organizations that develops partnerships, initiatives, programs and projects (PIPP's) designed to facilitate risk reduction associated with climate driven events, i.e., floods, droughts, fires, hurricanes, sea-level rise, etc. ACRE is very member driven and its aim is to enhance the mission of its members in reducing that risk. A question that is always asked of members when they register is "What do you want to lay on the ACRE table you would like to scale and share with the world?". The alliance has an overarching goal of accelerating the "pace of play" in the resilience space by two aspirations:

1. De-fragmenting the space to reduce "reinvention of the wheel" and
2. De-siloing the space to create better collaboration between sectors

The heart of ACRE is its Areas of Focus which have been turned into Working Groups. Every ACRE member picks and Area of Focus and subsequent Working Group in which they operate and they also pick a secondary, and if desired, third working group that is not in their area of expertise. This is done to create collaboration between sectors to reduce the siloing effect. Areas of Focus are:

- Infrastructure & Supply Chain
- Finance and Institutional Investment
- Insurance & Reinsurance
- Security & Culture of Preparedness
- Ecosystems & Natural Infrastructure
- Energy
- Food & Agriculture
- Water & Sanitation

Working groups have co-chairs and this is where PIPP's are brought to the ACRE table. However, if left there no benefit will occur, so they must be moved to other methodologies to be share with the world.

The ACRE/ASCE Partnerships

The largest partnership to date for ACRE is with the American Society of Civil Engineers (ASCE). ASCE is worked for three years to develop a Sustainable Infrastructure Standard that came out of a public comment period on January 25 of this year. The 155,000-member organization has partnered with ACRE to help facilitate global adoption of the standard and to make it the criteria of choice as the world goes into the next 50 years. ACRE and ASCE are working with the Global Covenant of Mayors with 10,800 members and many country-specific engineering societies, including the International Federation of Engineering Organizations (IFEO) to foster adoption.

Other Partnerships in Various Stages of Development

1. ACRE-CCRI – The Coalition of Climate Resilient Investment(CCRI) is a London based organization of 62 investment firms and supporting organizations that have a combined asset base of approximately $10T. Of primary interest is an investment prioritization tool CCRI has developed.

2. Through the good work of Sarah Stimson Karis, a board member of the Stimson Center, a partnership agreement was signed by ACRE and the Prince Albert II of Monaco Foundation on August 31, 2020. ACRE will work with the Prince's Foundation to develop programs that promote climate resilience in coastal, oceanic, developing countries and small island states.

3. ACRE-GCA – The Global Center for Climate Adaptation is a Netherlands developed organization this brings together heads of state for adaptation action, focusing on Africa and Asia. ACRE's partnership with GCA is under development and has an MOU that is currently being written.

4. SRRR – The Sustainable and Resilient Resources Roundtable as the first member of ACRE and helps gather information on sustainability and resilience in the US by convening a series of workshops, seminars and gatherings to collect pertinent information on what is happening in the space.

5. Solutions Journal – This online and printed magazine is ACRE's journal of record, with the first ACRE article published in the December 2020 edition.

ACRE Initiatives That Are Not Partnerships

1. The Diplomatic Council for Climate Resilience (DCCR) is a delivery system for ACRE PIPP's using the national embassies located in Washington DC. A host committee of the UK, Canada, The Netherlands and Italy will host the inaugural event in late spring 2021 with subsequent events rotating at participating embassies DC. This is one of the venues where PIPP's can be shared globally share by a unique type of "delivery system" that DCCR will become.

2. The ACRE Innovation Council is an engagement organization designed for ACRE universities and research centers. It is a source of university interns and connects students with potential employers that are ACRE members.

3. SustainChain is an artificial intelligence tool that acts like a partner discovery and development program for ACRE members seeking to find those who can add strength to their capabilities.

Enterprise Partnerships

The problem of scale for climate resilience solutions can be address by combining the capabilities of ACRE members that might be working on a common effort. ACRE facilitates these partnerships and supports them, but does not enter into the partnership. The models for this concept is the Dutch development of the Delta Works Program, Scripps La Jolla and MIT's spin-off companies. A variety of choices can characterize an Enterprise Partnership:

- Public, Private or Public Private
- For profit or not-for-profit

- Permanent or temporary – many of the Delta Works partnerships were dissolved after the project they worked on was completed

Through ACRE's newest partnership with the Small Island Developing States DOC (SIDS Dock), ACRE is looking at creating unique partnerships with members doing work on things like ocean energy. At least seven ACRE members are doing work in this area including Lockheed Martin, Siemens, two DOE National Labs and several ACRE universities. Combining their efforts in an Enterprise Partnership will create critical mass and make it easier for this energy solution to scale.

Colorado River Basin Governance, Decision Making, and Alternative Approaches

Rich Juricich, Principal Engineer, Colorado River Board of California

Rich Juricich explained that he give some background on the Colorado River Basin and its current hydrologic conditions, and then focus on management and decision making within the basin.

Rich began with a description of his agency, The Colorado River Board of California. It represents California in discussions among the Colorado River Basin States, Indian Tribes, the federal government, and others in implementing joint cooperative programs to protect California's use of Colorado River water and to address environmental and endangered species issues. The board is actually a small California state agency with eleven full time staff. The staff support a ten-member board made up of two state agencies, two members of the public, and six water district agencies that have water and or power rights to the Colorado River.

Major challenges addressed in the Basin include:

- Climate Change and Drought
- Water Use
- Salton Sea Management
- Endangered Species
- Colorado River Delta
- Stakeholder Inclusion

Colorado River Basin

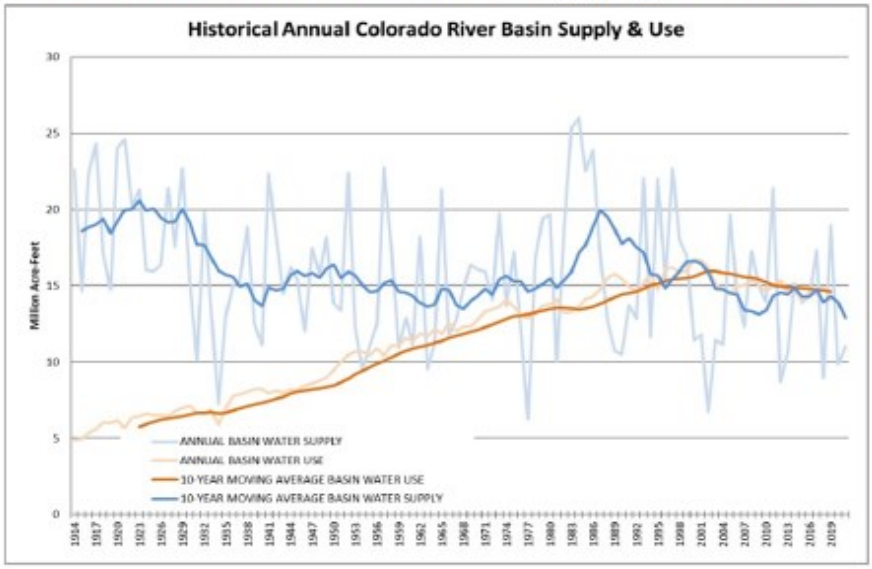
1. Glen Canyon Dam & Lake Powell
   - 24.3 MAF Capacity
   - Lee Ferry just downstream is the dividing point for Upper and Lower Basin
2. Hoover Dam & Lake Mead
   - 26.1 MAF Cap with flood space
   - Southern Nevada
3. Parker Dam & Lake Havasu
   - Colorado River Aqueduct
   - Central Arizona Project
4. Imperial Diversion
   - All American Canal

Map Source: U.S. Bureau of Reclamation

The Colorado River has its headwaters in the Rockies in the northern part of the state of Colorado. It flows downstream to Glen Canyon Dam. Just below Glen Canyon Dam is Lee Ferry, the legal dividing point between the upper basin and the lower basin. The upper basin is comprised of four upper division states, Utah, Wyoming, Colorado, and New Mexico. The lower basin is comprised of the three lower basin states, Nevada, Arizona and California. The basin supports 40 million people. It supplies over five and a half million acres of irrigated agricultural within the US, and another half a million acres of irrigated agricultural within Mexico.

The Bureau of Reclamation has done a top notch job of graphing the water budgets associated with the Colorado River.

Colorado River Basin Supply & Use



Supply: the natural flow that would have occurred at a given location, absent consumptive use and reservoir regulation upstream of that location.

Use: Includes use in the Upper Basin, Lower Basin, treaty delivery to Mexico, reservoir evaporation, Lower Basin phreatophytes, excess flows to Mexico, and bypasses to the Cienega de Santa Clara.

The light blue line in this this diagram is the annual supply from natural flow within the basin. The dark blue line is the ten year moving average of supply over time. The dark orange line is the 10 year moving average of demands within the basin. There is a dry period starting in the 80s and by 2000 demand is above the supply line. That is when water was pulled heavily from the main reservoirs Lake Powell and Lake Mead to meet the demands in the system. This was reflected in a steep decline in the storage in those reservoirs.

Rich reviewed graphs of projected operations of Lake Powell and Lake Mead. The projections show that Lake Mead will reach tier one shortage this May. Beginning in calendar year 2022, reclamation will implement what they call tier one shortage criteria in several states.

Rich turned to discussion of government and decision making within the basin. The river is managed according to a number of court decrees, regulations, rules, and environmental requirements. Collectively, these are all referred to as the law of the river. A number of programs are in place to implement the law of the river. Rich described a few of them.

The seven basin states that receive water from the Colorado River Basin meet periodically to respond to pressing management issues that arise. The decision making is organized by official federal and state representatives authorized to make decisions regarding the issues being discussed. These meetings are scheduled on an ad hoc basis. As issues come up the they gather to discuss options for moving forward.

A big program is the Glen Canyon Dam adaptive management program. The high pulse flows that took place in the Grand Canyon National Park were done under this program. The overall purpose of the program is long-term monitoring and activities to protect, mitigate adverse impacts to, and improve the values for Grand Canyon National Park and Glen Canyon National Recreation Area. Decision making is done through an adaptive management workgroup. It is an official Federal Advisory Committee appointed by the Secretary of the Interior with a very large membership including state representatives, NGOs, tribes, recreation and federal power interests.

Rich described binational decision making in the International Boundary and Water Commission. The group included the United States and Mexico. Each are independent, but they work collaboratively to solve problems on the river. Decision making is through a number of work groups on different topics, such as environment, salinity, and hydrology.

Summary and Conclusions

- Management of the challenges facing the Colorado River occurs through well-established groups of binational, federal, state and local agencies.
- Due to its responsibility in managing federal facilities along the River, most basin-wide decisions are made by the Department of Interior and Reclamation with significant input from other federal agencies, Basin States, and other stakeholders.
- Reclamation has initiated a process to renew the Operating Guidelines for Lakes Powell and Mead, which expire at the end of 2026.
- The Basin should consider how to integrate management and decision-making across the program-specific management groups through communication, cooperation, and coordination.

Open Session: David asked the participants to consider two questions:

1. What topics would you find most useful for future SRRR meetings?

2. Do you have a project in the works for which feedback from participants in a SRRR workshop would be helpful or is there a project you are about to release for which a presentation at a SRRR workshop would help support the launch and dissemination?

David said that when the Roundtable was holding in-person meetings, we often designed our agenda to be include topics of interest to participants in those parts of the country: California? New England? Florida? The Great Lakes or the Greater Washington DC area? Now with virtual meetings our participants at each meeting have been tuning in from all over the country and from abroad. The first question for us to discuss is, what topics or sets of information would be of greatest interest to you and your organization for a future workshop?

The second question is if you or your organization have an upcoming project or set of data or indicators or a policy launch related to resource sustainability or resilience, for which it would be valuable to you to get confidential feedback on your draft publication, policy idea or draft indicators. When we did live meetings, we would ask the participants to not share what they heard in the sessions if asked by the presenters, and we would ensure that our proceedings reflected what the organization presenting the materials wanted shared after the fact. In some cases, what we presented in the proceedings was their final data set or final report as modified after the input from the meeting.

Another use of a Roundtable workshop is the launch of a policy or information release to help publicize and disseminate the work through our list of several hundred resource professionals and their organizations and distribution lists. So pre-completion or post completion, we are at your service.

We will discuss comments now, but you are welcome to send an email about any of these ideas to info@sustainableroundtable.org

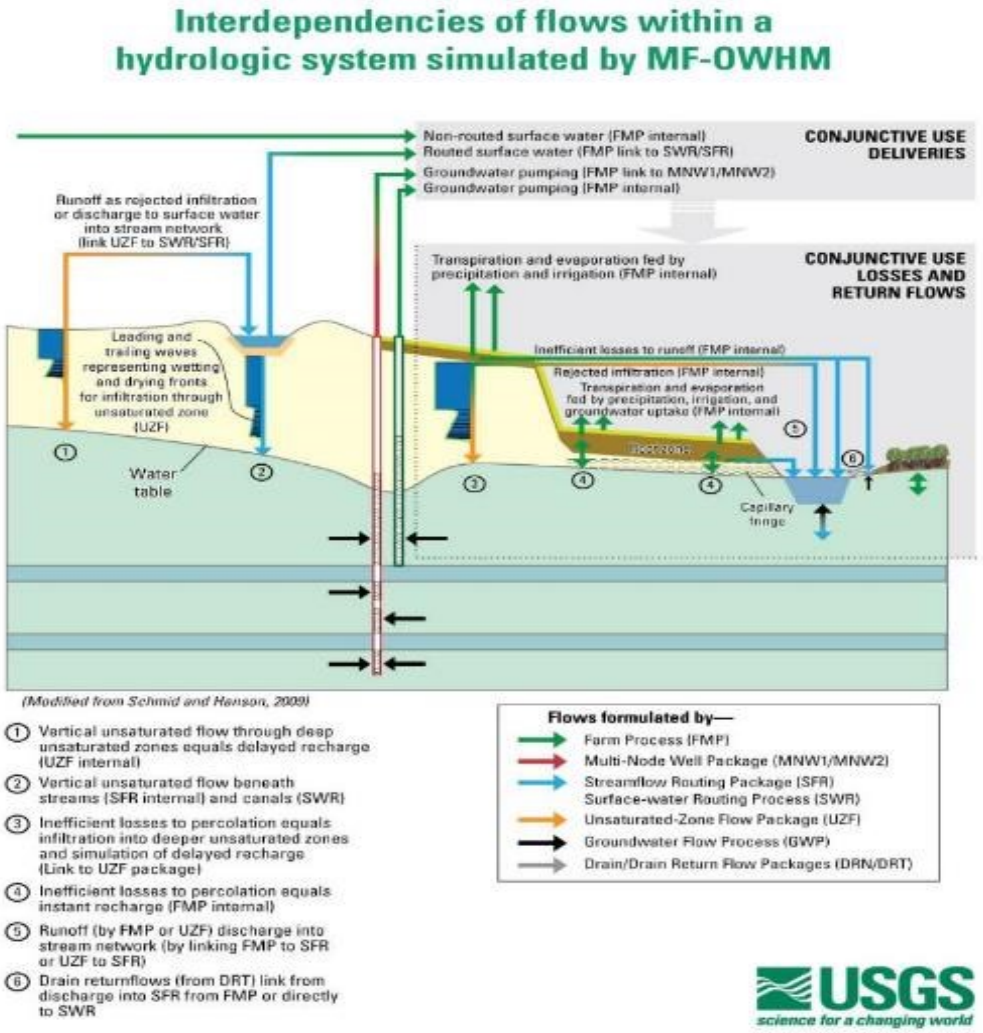
Abdul Khan: This is related to the first question. I think how interesting it would be to have a water governance workshop, where we have presentation from multiple states, some in the East, some in the West and some in the Central states. I'd be really interested to learn about what's happening with water governance across the states in the US. Thank you.

Bob Boyd: I was going to toss out the issues of reservoir sustainability. Many of our old reservoirs are filling up with sediment. The reservoirs are doing their engineering function and yet, sediment is a problem that gets kicked down the road. There used to be a subgroup of ACWI looking at sediment. That committee put out a lot of good information products over the years, guidance documents and other things. It would be helpful to keep this issue out in front, because it's also a climate change issue. A full reservoir can't meet its functions of storing water, or flood control. There is going to be a lot of activity there looking at how to dredge and

what do we do with the sediments? If we have wildfires and debris flows, how do we deal with that? Here in Colorado, that's a huge issue for municipalities and their water storage structure. So is something worth looking at.

Alexandra Sokol: One of my focuses is coastal communities. We had great meetings in New Orleans with people in the community. I'd love to see what new solutions to disaster resilience in coastal communities other people are working on. We are dealing in Santa Monica now with issues along the coastline such as power and utilities storage of natural gas. Another example is Ballona Wetlands Ecological Preserve where we have inundation of water. We're looking at seepage into local communities and the potential for fire disaster.

Scott E Boyce: I am happy to collaborate on climate and groundwater resources. I'm a Hydrologist/Software Developer at USGS and an Adjunct Professor at the Technical University of Munich. Thanks to Abdul and DWR for the amazing Handbook. I cite it all the time.



David: Thank you all for your good ideas and input to this discussion. It will help shape our future meetings. You or someone in your organization could be invited to make a presentation within the overall theme of a workshop.

I want to give my heartfelt thanks to all the presenters today for the depth of information and the animated way in which you presented it. Thank you also to the participants and the contributions you made. The proceedings of this workshop will be sent to you and posted on the web site as will the link to the video.

Here is a thought to close on. Sometime in the next few months, this country will be approaching normal operations again. Let us bear in mind that there are people around the world working on the sustainability and resilience challenges with which we have engaged today. People I am working with in India, Brazil and elsewhere via Zoom will continue to deal with the tribulations we have faced for perhaps a few more years.

I've worked in Russia where Russian friends told me that cosmonauts had the same profound experiences looking down on Earth that our astronauts sometimes reported. Those early cosmonauts were all military officers. When they returned to Earth deeply moved by witnessing a living biosphere on a planet without visible borders, my friends in the Academy of Science said, with some humor, that this was a problem for the military, who couldn't have senior military officers going around talking about an integrated interrelated living planet.

I would like to footnote that what we're learning here, and what we're accomplishing here, and what we're going through here is a common problem around the planet. To collectively make contributions in that area, let's use every platform we have, including this one.

If you have an afterthought for a question or comment after we end the call, you can email us at info@sustainableroundtable.org Thanks, everybody. Have a great weekend.